Table F2-1
Cost Summary of Groundwater Remedial Alternatives

Alternative	General Response Action	Technology	<u>Capital Costs</u>	Mob/Demob	Engineering	Construction Oversight	Contingency	Post Construction OM&M	Total
CWA	No Action	No Action	\$0	\$0	\$0	\$0	\$0	\$0	\$0
GWI	NO ACTION	NO ACTION	20	Φυ	Φ0	Φυ	Φ0	Φυ	Φυ
GW2A	Containment	Engineered Surface & Vertical Barriers		l				l l	
	-	Copper Falls Aquifer	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Shallow Groundwater - Filled Ravine	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
		Shallow Groundwater - Kreher Park (partial cap)	\$4,237,768	\$211,888	\$635,665	\$635,665	\$847,554	\$2,504,757	\$9,073,298
		Tota	al \$4,343,324	\$217,166	\$651,499	\$651,499	\$868,665	\$2,504,757	\$9,236,909
CWOD	Containment	Engineered Curtoes & Vertical Berriers							
GWZB	Containment	Engineered Surface & Vertical Barriers  Copper Falls Aquifer	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Shallow Groundwater - Filled Ravine	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
		Shallow Groundwater - Kreher Park (cap entire Park)	\$6,030,852	\$301,543	\$904,628		\$1,206,170	\$1,469,226	\$10,817,047
		Total	. , ,	\$306,820	\$920,461	\$920,461	\$1,227,282	\$1,469,226	\$10,980,658
			, , , , , ,	, , , , ,	, , ,	, ,	, , , ,	, , , , ,	, ,,,,,,,,,
GW3	In-situ Treatment								
		Copper Falls Aquifer	\$763,000	\$38,150	\$114,450	\$114,450	\$152,600	\$694,704	\$1,877,354
		Shallow Groundwater - Filled Ravine	\$133,000	\$6,650	\$19,950	\$19,950	\$26,600	\$63,550	\$269,700
		Shallow Groundwater - Kreher Park  Tota	\$1,009,000 at \$1,905,000	\$50,450 <b>\$95,250</b>	\$151,350 <b>\$285,750</b>	\$151,350 <b>\$285,750</b>	\$201,800 <b>\$381,000</b>	\$84,050 <b>\$842,304</b>	\$1,648,000 <b>\$3,795,054</b>
		Tota	\$1,905,000	\$95,250	\$200,700	\$200,750	\$361,000	\$042,304	\$3,795,054
GW4	In-situ Treatment	Surfactant Injection/Dual Phase Recovery		<u> </u>					
		Copper Falls Aquifer	\$479,800	\$23,990	\$71,970	\$71,970	\$95,960	\$682,404	\$1,426,094
		Shallow Groundwater - Filled Ravine	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Shallow Groundwater - Kreher Park	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Tota	al \$479,800	\$23,990	\$71,970	\$71,970	\$95,960	\$682,404	\$1,426,094
014/5		D							
GW5	in-situ i reatment	Permeable Reactive Barrier Well Copper Falls Aquifer	\$0	\$0	\$0	\$0	\$0	\$0	\$0
		Shallow Groundwater - Filled Ravine	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
		Shallow Groundwater - Kreher Park	\$3,650,174	\$182,509	\$547,526	\$547,526	\$730,035	\$397,088	\$6,054,858
		Total	. , ,	\$187,786	\$563,359	\$563,359	\$751,146	\$397,088	\$6,218,469
					•		•		
GW6	In-situ Treatment	Chemical Oxidation		<b>.</b>					
		Copper Falls Aquifer	\$2,017,500	\$100,875	\$302,625		\$403,500	\$2,596,420	\$5,723,545
	1	Shallow Groundwater - Filled Ravine	\$1,333,333	\$66,667	\$200,000	\$200,000	\$266,667	\$67,363	\$2,134,029
		Shallow Groundwater - Kreher Park  Tota	\$1,352,389 al <b>\$4,703,222</b>	\$67,619 <b>\$235,161</b>	\$202,858 <b>\$705,483</b>	\$202,858 <b>\$705,483</b>	\$270,478 <b>\$940,644</b>	\$94,308 <b>\$2,758,090</b>	\$2,190,510 <b>\$10,048,085</b>
		700	ψ4,100,222	Ψ233,101	ψ100,400	Ψ100,403	ψ3+0,0++	Ψ2,730,030	ψ10,040,000
GW7	In-situ Treatment	Electrical Resistance Heating		•					
		Copper Falls Aquifer	\$4,439,200	\$221,960	\$665,880		\$887,840		\$7,003,760
		Shallow Groundwater - Filled Ravine	\$2,852,633	\$142,632	\$427,895	\$427,895	\$570,527	\$51,250	\$4,472,832
		Shallow Groundwater - Kreher Park	\$2,949,628	\$147,481	\$442,444	\$442,444	\$589,926	\$71,750	\$4,643,673
		Tota	al \$10,241,461	\$512,073	\$1,536,219	\$1,536,219	\$2,048,292	\$246,000	\$16,120,265
GW8	In-situ Treatment	Dynamic Underground Stripping / CROW							
3.10	one .rouniont	Copper Falls Aquifer (DUS)	\$4,637,200	\$231,860	\$695,580	\$695,580	\$927,440	\$123,000	\$7,310,660
		Shallow Groundwater - Filled Ravine (CROW)	\$1,698,333	\$84,917	\$254,750	\$254,750	\$339,667	\$51,250	\$2,683,667
		Shallow Groundwater - Kreher Park (CROW)	\$1,581,111	\$79,056	\$237,167	\$237,167	\$316,222	\$71,750	\$2,522,472
		Tota	\$7,916,644	\$395,832	\$1,187,497	\$1,187,497	\$1,583,329	\$246,000	\$12,516,799
A117- ·									
GW9A	Removal	Groundwater Extraction - Existing System	<b>#</b> 0	¢Λ	<b></b>	¢ο	<b></b>	\$3 330 466	\$3.330 AEE
		Copper Falls Aquifer Shallow Groundwater - Filled Ravine	\$0 \$105,556	\$0 \$5,278	\$0 \$15,833	\$0 \$15,833	\$0 \$21,111	\$2,220,466 \$0	\$2,220,466 \$163,611
		Shallow Groundwater - Filled Ravine Shallow Groundwater - Kreher Park	\$105,556	\$5,278 \$0	\$15,833		\$21,111	\$0 \$0	\$163,611
		Total		\$5,278	\$15,833		\$21,111	\$2,220,466	\$2,384,078
			7.123,000	7-,0	7.2,000	7:2,000	7,,	<del></del>	<del>,,</del>
GW9B	Removal	Groundwater Extraction - Enhanced System							
		Copper Falls Aquifer	\$284,500	\$14,225	\$42,675	\$42,675	\$56,900	\$5,978,656	\$6,419,631
		Shallow Groundwater - Filled Ravine	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
		Shallow Groundwater - Kreher Park	\$966,278	\$48,314	\$144,942		\$193,256		\$18,890,185
		Total	al \$1,356,333	\$67,817	\$203,450	\$203,450	\$271,267	\$23,371,111	\$25,473,427

Table F2-2
Summary of Wastewater Treatment Volumes for Potential Groundwater Remedial Alternatives

GW-1	No Action	none	none	none	none
GW-2A	Containment - surface (partial cap) & vertical barriers	from infiltration	none	discharge to Park	2,250,000 gal per year
GW-2B	Containment - surface (cap entire Park) & vertical barriers	from infiltration	none	discharge to Park	893,000 gal per year
GW-3	Ozone Sparge	existing system	3 gpm for 5 years	included w/Copper Falls	none
GW-4	Surfactant/Dual Phase Recovery	existing system	3 gpm for 5 years	included w/Copper Falls	none
GW-5	Permeable Reactive Barrier Wall	from infiltration	none	discharge to Park	discharge thru PRB
GW-6	In-situ Chemical Oxidation	enhanced system	15 gpm for 7 years	none	none
GW-7	Electrical Resistance Heating	enhanced system	20 gpm for 12 months	10 gpm for 12 months	20 gpm for 12 months
GW-8	Steam Injection (DUS and CROW)	enhanced system	20 gpm for 6 months	10 gpm for 6 months	20 gpm for 6 months
GW-9A	Groundwater Extraction - Existing System	existing system	3 gpm for 5 years	included w/Copper Falls	none
GW-9B	Groundwater Extraction - Enhanced System	enhanced system	15 gpm for 30+ years	included w/Copper Falls	50 gpm for 30+ years

Table F2-3
Alternate GW2A: Containment Using Engineered Surface and Vertical Barriers (Partial Cap for Kreher Park)

	Alternate GW2A: Containm	ieni osing i	gooou c	dilace alla ver		Cap for faction fairly
Containment:	Surface Barriers					
					Total Area:	
	1 Asphalt Pavement -				16,000 sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches s	urface.			22,000 sq ft	NSPW Property North of St. Claire Street
					98,000 sq ft	Marina Parking Lot Area
	2 Low Permeability Cap -					
	Includes 3 feet of clay.				42,500 sq ft	Former Coal Tar Dump Area
					5,000 sq ft	TW-11 Area
					72,000 sq ft	WWTP Area
<b>Upland Area</b>	Shallow Groundwater - Filled Ravine				·	
Itama Na	Mann	l lmit	Overstitus	Unit Coot	Tatal	Nata
<u>Item No.</u>	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Installation of new asphalt pavement	sq. yd.	1,778	\$25	\$44,444	NSPW Property South of St. Claire Street (includes grading)
	2 Installation of new asphalt pavement	sq. yd.	2,444	\$25	\$61,111	NSPW Property North of St. Claire Street (includes grading)
		- 4. 7	_,	Subtotal	\$105,556	g g.
					ψ100,000	
	Mobilization/Demobilization @	5%	of	\$105,556	\$5,278	
	Engineering @	15%	of	\$105,556	\$15,833	
	Construction Oversight @	15%	of	\$105,556	\$15,833	
	ŭ			Subtotal	\$142,500	
	Contingency @	20%	of	\$105,556	\$21,111	
	Commigation (	2070	o.	ψ.σσ,σσσ	Ψ= :, : : :	
				Total	\$163,611	
Kreher Park	Shallow Groundwater - Kreher Park					
	Former Coal Tar Dump and TW-11 Areas					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	Notes Notes
<u></u>		<u> </u>		Gint Goot		
<u></u>	<del></del>		<del></del>			<del></del>
<u></u>	1 Clear and Grub	est.	1	\$10,000	\$10,000	
<u></u>	Clear and Grub     Installation of new asphalt pavement	est. sq. yd.	1 10,889	\$10,000 \$25	\$10,000 \$272,222	Marina Parking Lot Area
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap	est. sq. yd. cy	1 10,889 5,278	\$10,000 \$25 \$25	\$10,000 \$272,222 \$131,944	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil	est. sq. yd. cy sq. yd.	1 10,889 5,278 5,278	\$10,000 \$25 \$25 \$18	\$10,000 \$272,222 \$131,944 \$95,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation	est. sq. yd. cy sq. yd. acre	1 10,889 5,278 5,278 1.1	\$10,000 \$25 \$25 \$18 \$3,500	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System	est. sq. yd. cy sq. yd. acre est.	1 10,889 5,278 5,278 1.1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline	est. sq. yd. cy sq. yd. acre est. sf	1 10,889 5,278 5,278 1.1 1 38,750	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter	est. sq. yd. cy sq. yd. acre est. sf	1 10,889 5,278 5,278 1.1 1 38,750 32,000	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench	est. sq. yd. cy sq. yd. acre est. sf sf In ft	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells	est. sq. yd. cy sq. yd. acre est. sf sf In ft each	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping	est. sq. yd. cy sq. yd. acre est. sf sf ln ft each each ln ft	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100 \$75	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping	est. sq. yd. cy sq. yd. acre est. sf sf ln ft each each ln ft	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100 \$75 \$30,000	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500 \$30,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft In ft	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100 \$75	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment	est. sq. yd. cy sq. yd. acre est. sf ln ft each each In ft ln ft	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100 \$75 \$30,000	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500 \$30,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft each each each	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100 \$75 \$30,000 \$25,000	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep).
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System	est. sq. yd. cy sq. yd. acre est. sf sf ln ft each each ln ft ln ft each each Est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft each each Est. est.	1 10,889 5,278 5,278 5,278 1.1 1 38,750 32,000 1,525 15 2,500 1,500 1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 <b>Subtotal</b>	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$5,000	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  subtotal  Mobilization/Demobilization @	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft ln ft each each Est. est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 <b>Subtotal</b> \$3,607,983	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$55,000 \$15,000 \$1,	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park  Groundwater use and deed restrictions.
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  Mobilization/Demobilization @ Engineering @	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft ln ft each each Est. est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 \$5,000 \$3,607,983	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$15,000 \$5,000 \$180,399 \$541,197	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  subtotal  Mobilization/Demobilization @	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft ln ft each each Est. est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 \$5,000 \$3607,983 \$3,607,983	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$15,000 \$3,607,983	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park  Groundwater use and deed restrictions.
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  Mobilization/Demobilization @ Engineering @ Construction Oversight @	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft ln ft each each Est. est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 2,500 1,500 1 1	\$10,000 \$25 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 \$3607,983 \$3,607,983 \$3,607,983 \$3,607,983 \$3,607,983	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$15,000 \$3,607,983	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park  Groundwater use and deed restrictions.
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  Mobilization/Demobilization @ Engineering @	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft ln ft each each Est. est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 15 2,500 1,500 1	\$10,000 \$25 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 \$5,000 \$3607,983 \$3,607,983	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$15,000 \$3,607,983	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park  Groundwater use and deed restrictions.
	1 Clear and Grub 2 Installation of new asphalt pavement 3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Storm water Drainage System 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  Mobilization/Demobilization @ Engineering @ Construction Oversight @	est. sq. yd. cy sq. yd. acre est. sf sf In ft each each In ft ln ft each each Est. est.	1 10,889 5,278 5,278 1.1 1 38,750 32,000 1,525 15 2,500 1,500 1 1	\$10,000 \$25 \$25 \$25 \$18 \$3,500 \$30,000 \$35 \$35 \$50 \$2,500 \$100 \$75 \$30,000 \$25,000 \$15,000 \$5,000 \$3607,983 \$3,607,983 \$3,607,983 \$3,607,983 \$3,607,983	\$10,000 \$272,222 \$131,944 \$95,000 \$3,817 \$30,000 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$15,000 \$3,607,983	Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park  Groundwater use and deed restrictions.

Table F2-3
Alternate GW2A: Containment Using Engineered Surface and Vertical Barriers (Partial Cap for Kreher Park)

#### Shallow Groundwater - Kreher Park WWTP Area

Item No.	Item	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 WWTP Building Demolition	est.	1	\$250,000	\$250,000	
	2 Installation of low permeability cap	су	8,000	\$25	\$200,000	3 ft. of clay at WWTP area (post demolition)
	3 Top Soil	sq. yd.	8,000	\$18	\$144,000	0.5 ft. topsoil cover over clay cap
	4 Vegetation	acre	1.7	\$3,500	\$5,785	Seeding
	5 Storm water Drainage System	est.	1	\$30,000	\$30,000	For water runoff during storm post-remediation
				Subtotal_	\$629,785	
	Mobilization/Demobilization @	5%	of	\$629,785	\$31,489	
	Engineering @	15%	of	\$629,785	\$94,468	
	Construction Oversight @	15%	of	\$629,785	\$94,468	
				Subtotal	\$850,210	
	Contingency @	20%	of	\$629,785	\$125,957	
				Total_	\$976,167	
Post Construc	etion et ion					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Costs	<u>Total</u>	
	1 Annual Inspections	yr	30	\$250	\$7,500	
	2 Post-Closure Reporting/Record Keeping	yr	30	\$500	\$15,000	
	3 Cap Maintenance	yr	30	\$1,000	\$30,000	
	4 Groundwater Extraction System O & M	yr	30	\$57,600	\$1,728,000	\$4,800 per month
	5 Groundwater monitoring	yr	30	\$25,000	\$750,000	shallow groundwater monitoring
	6 Annual cap inspection and reporting	yr	30	\$5,000	\$150,000	
	7 Groundwater treatment & disposal	yr	30	\$112,500	\$3,375,000	2,250,000 gallons per year (from infiltration)
			Subtotal	\$201,850	\$6,055,500	
	ı	Present worth	@7% Discount	_	\$2,504,757	
			CD.	AND TOTAL	to 226 000	

# GRAND TOTAL \$9,236,909

					Construction		OM & M	<b>Estimated</b>
Summary		Capital Costs	Mob / Demob	<b>Engineering</b>	Oversight	Contingency	<u>Costs</u>	Cost
	Installation of surface barrier - upper bluff area	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
	Installation of surface & vertical barrier - Kreher Park	\$3,607,983	\$180,399	\$541,197	\$541,197	\$721,597	\$0	\$5,592,374
	WWTP Demolition and clay cap	\$629,785	\$31,489	\$94,468	\$94,468	\$125,957	\$0	\$976,167
	Post construction maintenance and monitoring (30 years)	\$0	\$0	\$0	\$0		\$2,504,757	\$2,504,757
	Total Estimated Cost	\$4,343,324	\$217,166	\$651,499	\$651,499	\$868,665	\$2,504,757	\$9,236,909

Includes groundwater monitoring costs for shallow groundwater

Table F2-4
Alternate GW2B: Containment Using Engineered Surface and Vertical Barriers ( Cap for Kreher Park)

Containment:	Surface Barriers					
	1 Asphalt Pavement - Includes 6 inches stone, 3 inches binder, 2 inches st	ırface.			Total Area: 16,000 sq ft 22,000 sq ft 98,000 sq ft	NSPW Property South of St. Claire Street NSPW Property North of St. Claire Street Marina Parking Lot Area
	2 Low Permeability Cap - Includes 3 feet of clay.				11.5 Acres	Kreher Park
<u>Upland Area</u>	Shallow Groundwater - Filled Ravine					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	Installation of new asphalt pavement     Installation of new asphalt pavement	sq. yd. sq. yd.	1,778 2,444	\$25 \$25 Subtotal	\$44,444 \$61,111 <b>\$105,556</b>	NSPW Property South of St. Claire Street (includes grading) NSPW Property North of St. Claire Street (includes grading)
	Mobilization/Demobilization @ Engineering @ Construction Oversight @	5% 15% 15%	of of of	\$105,556 \$105,556 \$105,556 <b>Subtotal</b>	\$5,278 \$15,833 \$15,833 <b>\$142,500</b>	
	Contingency @	20%	of	\$105,556	\$21,111	
Kreher Park	Shallow Groundwater - Kreher Park Former Coal Tar Dump and TW-11 Areas			Total	\$163,611	
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	<u>Unit Cost</u>	<u>Total</u>	<u>Notes</u>
	1 Clear and Grub 2 WWTP Building Demolition	est. est.	1	\$10,000 \$250,000	\$10,000 \$250,000	
	3 Installation of low permeability cap 4 Top Soil 5 Vegetation 6 Installation of new asphalt pavement 7 Vertical barrier wall - along shoreline 8 Vertical barrier wall - perimeter 9 Groundwater Diversion Trench 10 Groundwater Extraction Wells 11 Well Pumps 12 Extraction Well Lateral Piping 13 Discharge Lateral Piping 14 Treatment equipment 15 Building 16 UST/OWS System 17 Institutional Control Implementation  subtotal  Mobilization/Demobilization @	cy sq. yd. acre sq. yd. sf sf In ft each each In ft In ft each each Est. est.	55,660 55,660 11.5 10,889 38,750 32,000 1,525 15 15 2,500 1,500 1 1	\$25 \$18 \$3,500 \$25 \$35 \$35 \$50 \$2,500 \$1,000 \$75 \$30,000 \$25,000 \$15,000 \$5,000 \$ubtotal	\$1,391,500 \$1,001,880 \$40,250 \$272,222 \$1,356,250 \$1,120,000 \$76,250 \$37,500 \$37,500 \$250,000 \$112,500 \$30,000 \$25,000 \$15,000 \$5,000 \$6,030,852	3 ft. of clay over former coal tar dump area 0.5 ft. topsoil cover over clay cap Seeding Marina Parking Lot Area Sheet pile wall (1,550 linear feet and 25 feet deep). Sheet pile wall (2,000 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park Groundwater use and deed restrictions.
	Engineering @ Construction Oversight @	15% 15%	of of	\$6,030,852 \$6,030,852 <b>Subtotal</b>	\$904,628 \$904,628 <b>\$8,141,651</b>	Includes WPDES permit application.
	Contingency @	20%	of	\$6,030,852	\$1,206,170 \$9,347,821	
				TOTAL	ψ3,J41,021	

Table F2-4
Alternate GW2B: Containment Using Engineered Surface and Vertical Barriers ( Cap for Kreher Park)

### Post Construction

Item No.	<u>Item</u>	<u>Unit</u>	Quantity	Unit Costs	<u>Total</u>	
	1 Annual Inspections	yr	30	\$250	\$7,500	
	2 Post-Closure Reporting/Record Keeping	yr	30	\$500	\$15,000	
	3 Cap Maintenance	yr	30	\$1,000	\$30,000	
	4 Groundwater Extraction System O & M	yr	30	\$42,000	\$1,260,000	\$3,500 per month
	5 Groundwater monitoring	yr	30	\$25,000	\$750,000	shallow groundwater monitoring
	6 Annual cap inspection and reporting	yr	30	\$5,000	\$150,000	
	7 Groundwater treatment & disposal	yr	30	\$44,650	\$1,339,500	893,000 gallons per year (from infiltration)
		-	Subtotal	\$118,400	\$3,552,000	
		Present work	th @7% Discou	ınt _	\$1,469,226	

# GRAND TOTAL \$10,980,658

		<u>Capital</u>			Construction		OM & M	<b>Estimated</b>
Summary		Costs	Mob / Demob	Engineering	Oversight	Contingency	Costs	Cost
	Installation of surface barrier - upper bluff area	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
	Installation of surface & vertical barrier - Kreher Park	\$6,030,852	\$301,543	\$904,628	\$904,628	\$1,206,170	\$1,469,226	\$10,817,047
	Total Estimated Cost	\$6,136,408	\$306,820	\$920,461	\$920,461	\$1,227,282	\$1,469,226	\$10,980,658

Includes groundwater monitoring costs for shallow groundwater

Table F2-5 Alternate GW3: Ozone Sparge

## In-situ Treatment Ozone Sparge

<u>Upland Area</u> Item No.	Copper Falls Aquifer Item	Unit	Quantity	Unit Cost	<u>Total</u>	Notes
item No.	<u>kem</u>	<u>ome</u>	Quartity	Onit Cost	<u>rotar</u>	1003
	Pilot Test	estimate	1	\$25,000	\$25,000	
	Sparge point well installation	each	72	\$1,500	\$108,000	12 sparge wells per control panel
	2 Sparge well line installation	In ft	10,800	\$40	\$432,000	150 feet per sparge well
	3 Control panel	each	6	\$33,000	\$198,000	
				Subtotal _	\$763,000	
	Mobilization/Demobilization @	5%	of	\$763,000	\$38,150	
	Engineering @	15%	of	\$763,000	\$114,450	
	Construction Oversight @	15%	of	\$763,000	\$114,450	
				Subtotal	\$1,030,050	
	Contingency @	20%	of	\$763,000	\$152,600	
				Total_	\$1,182,650	
Post Construct	tion_					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 O & M (ozone sparge)	year	5	\$3,000	\$15,000	
	2 O & M (groundwater treatment)	year	5	\$57,600	\$288,000	Existing groundwater treatment system
	3 Wastewater treatment	year	5	\$78,840	\$394,200	3 gpm @ \$0.05 per gallon
	4 Groundwater Monitoring	year	5	\$25,000	\$125,000	
	5 Annual report	year	5	\$5,000	\$25,000	
			Total _	\$169,440	\$847,200	
	P	resent worth @7%	Discount	_	\$694,704	
	Shallow Groundwater - Filled Ravine					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	Pilot Test	estimate	1	\$10,000	\$10,000	
	1 Sparge point well installation	each	12	\$1,500	\$18,000	12 sparge wells per control panel
	2 Sparge well line installation	In ft	1,800	\$40	\$72,000	150 feet per sparge well
	3 Control panel	each	1	\$33,000	\$33,000	
				Subtotal _	\$133,000	
	Mobilization/Demobilization @	5%	of	\$133,000	\$6,650	
	Engineering @	15%	of	\$133,000	\$19,950	
	Construction Oversight @	15%	of	\$133,000	\$19,950	
	Onet's server @	000/	- (	Subtotal _	\$179,550	
	Contingency @	20%	of	\$133,000	\$26,600	
				Total	\$206,150	
Post Construct	tion_					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	
	1 O & M (ozone sparge)	year	5	\$3,000	\$15,000	
	2 Groundwater Monitoring	year	5	\$10,000	\$50,000	
	3 Annual report	year	5	\$2,500	\$12,500	
			Subtotal	\$15,500	\$77,500	
				_		

Present worth @7% Discount

\$63,550

Table F2-5 Alternate GW3: Ozone Sparge

Kreher Park	Shallow Groundwater - Kreher Park							
Item No.	Snallow Groundwater - Krener Park <u>Item</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>		<u>Notes</u>	
	Pilot Test	estimate	1	\$25,000	\$25,000			
	1 Sparge point well installation	each	96	\$1,500	\$144,000			per control panel
	2 Sparge well line installation	In ft	14,400	\$40	\$576,000		150 feet per spa	rge well
	3 Control panel	each	8	\$33,000	\$264,000			
				Subtotal	\$1,009,000			
	Mobilization/Demobilization @	5%	of	\$1,009,000	\$50,450			
	Engineering @	15%	of	\$1,009,000	\$151,350			
	Construction Oversight @	15%	of	\$1,009,000	\$151,350			
				Subtotal	\$1,362,150			
	Contingency @	20%	of	\$1,009,000	\$201,800			
				Total	\$1,563,950			
					<b>+</b> 1,000,000			
Post Construct			_					
<u>ltem No.</u>	ltem	<u>Unit</u>	Quantity_	Unit Cost	<u>Total</u>			
	1 O & M (ozone sparge)	year	5	\$3,000	\$15,000			
	2 Groundwater Monitoring	year	5 5	\$15,000	\$75,000			
	3 Annual report	year	Subtotal	\$2,500 <b>\$20,500</b>	\$12,500 <b>\$102,500</b>			
			Gubtotai	Ψ20,300	ψ102,300			
		Present worth @7%	Discount	-	\$84,050			
			CB	AND TOTAL	\$2.70E.0E4			
			GK	AND IOTAL	\$3,795,054			
					Construction			Estimated
Summary		Capital Costs	Mob / Demob	Engineering	Oversight	Contingency	OM&M Costs	Cost
<del></del>	Ozone sparge - upper bluff Copper Falls Aquifer	\$763,000	\$38,150	\$114,450	\$114,450	\$152,600	\$694,704	\$1,877,354
	Ozone sparge - upper bluff shallow groundwater	\$133,000	\$6,650	\$19,950	\$19,950	\$26,600	\$63,550	\$269,700
	Ozone sparge - Kreher Park shallow groundwater	\$1,009,000	\$50,450	\$151,350	\$151,350	\$201,800	\$84,050	\$1,648,000
	Total Estimated Cost	\$1,905,000	\$95,250	\$285,750	\$285,750	\$381,000	\$842,304	\$3,795,054

Table F2-6
Alternate GW4: Surfactant Injection and Dual Phase (Vacuum Enhanced) Recovery

### In-situ Treatment Surfactant Injection & Dual Phase Recovery

Upland Area	Copper Falls Aquifer					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Extraction Wells	each	30	\$3,000	\$90,000	
	2 Surfactant Injection	per gal	45,000	\$5	\$225,000	300 gallons per well, and 5 applications
	3 Vacuum truck	hour	1,000	\$100	\$100,000	2 to 3 hours per month for one year
	4 Wastewater treatment & disposal (vac truck)	year	3	\$21,600	\$64,800	300 gallons per month per well@\$0.2 per gallon
				Subtotal	\$479,800	
	Mobilization/Demobilization @	5%	of	\$479,800	\$23,990	
	Engineering @	15%	of	\$479,800	\$71,970	
	Construction Oversight @	15%	of	\$479,800	\$71,970	
				Subtotal	\$647,730	
	Contingency @	20%	of	\$479,800	\$95,960	
				Total	\$743,690	
Post Construct	<u>tion</u>					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Operation and Maintenance	year	5	\$57,600	\$288,000	Maintain upgraded treatment system
	2 Groundwater extraction (existing wells)	year	5	\$78,840	\$394,200	3 gpm @ \$0.05 per gallon
	3 Groundwater Monitoring	year	5	\$25,000	\$125,000	
	4 Annual report	year	5	\$5,000	\$25,000	-
			Subtotal_	\$166,440	\$832,200	
		Present worth	@7% Discount		\$682,404	
			GRA	ND TOTAL	\$1,426,094	
					Oversight &	Oversight & Estimated
Summary			Capital Costs M	lob / Demob	Engineering	Engineering Contingency OM&M Costs Cost

				Overeignt a	O TOI DIGITE OF			Lotimatea	
nmary		Capital Costs Mo	b / Demob	Engineering	Engineering	Contingency	OM&M Costs	Cost	
	Surfactant injection and dual phase recovery	\$479,800	\$23,990	\$71,970	\$71,970	\$95,960	\$682,404	\$1,426,094	

Table F2-7
Alternate GW5: Permeable Reactive Barrier Well

	In-situ Treatme	ent Permeable Reactive Barrier Well					
Upland Area   Shallow Groundwater - Filled Ravine   Standard   Shallow Groundwater - Filled Ravine   Standard   Standar		Includes 6 inches stone, 3 inches binder, 2 inches s  2 Low Permeability Cap -	urface.			16,000 sq ft 22,000 sq ft 98,000 sq ft 42,500 sq ft	NSPW Property North of St. Claire Street Marina Parking Lot Area Former Coal Tar Dump Area
Hem No.   Notes   No						72,000 sq ft	WWTP Area
1 Installation of new asphalt pavement 2 Installation of new asphalt pavement 3	Upland Area	Shallow Groundwater - Filled Ravine					
2 Installation of new asphalt pavement   Sq. yd.   2,444   Subtotal   Subtotal   105.5666   105.566   105.566   105.566   105.566   105.566   105.566   105.566   105.566   105.566   105.566   105.566   105.566   105.5666	Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	Notes
Construction Oversight   15%   of \$105,556   \$15,833					\$25_	\$61,111	
Total   Shallow Groundwater - Kreher Park		Engineering @	15%	of	\$105,556 \$105,556	\$15,833 \$15,833	
Item No.   Item No.   Item   Unit   Quantity   Unit Cost   Total   Notes		Contingency @	20%	of	\$105,556	\$21,111	
Liem No.   Liem   Link   Quantity   Unit Cost   Total   Notes					Total	\$163,611	
1 Clear and Grub est. 1 \$10,000 \$10,000 250,000 3 Vertical barrier wall - along shoreline est. 1 \$250,000 \$250,000 3 Vertical barrier wall - perimeter sf 28,000 \$35 \$1,356,250 \$35 \$1,356,250 \$36,250 \$35 \$1,356,250 \$36,250	Kreher Park	Shallow Groundwater - Kreher Park					
2 WWTP Building Demolítion est. 1 \$250,000 \$250,000 3 Vertical barrier wall - along shoreline sf 38,750 \$38,750 \$31,356,250 \$35 \$1,356,250 \$35 \$1,356,250 \$35 \$1,356,250 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$880,000 \$35 \$800,000 \$35 \$800,000 \$35 \$800,000 \$35 \$35 \$800,000 \$35 \$35 \$800,000 \$35 \$35 \$800,000 \$35 \$35 \$35 \$35 \$35 \$35 \$35 \$35 \$35 \$35	Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	Notes
Total\$5,657,770		2 WWTP Building Demolition 3 Vertical barrier wall - along shoreline 4 Vertical barrier wall - perimeter 5 Groundwater Diversion Trench 6 PRB Excavation 7 Filter Sand 8 GAC cell 9 Top Soil 10 Vegetation 11 Installation of new asphalt pavement 12 Installation of low permeability cap 13 Installation of low permeability cap 14 Top Soil 15 Vegetation 16 Storm water Drainage System 17 Institutional Control Implementation  Mobilization/Demobilization @ Engineering @ Construction Oversight @	est. sf sf In ft cy cy cy sq. yd. acre sq. yd. cy sq. yd. acre Basin est.	1 38,750 28,000 1,525 1,222 489 326 4,722 1 10,889 4,722 8,000 8,000 1.7 2 1	\$250,000 \$35 \$35 \$35 \$50 \$100 \$18 \$3,500 \$25 \$25 \$25 \$18 \$3,600 \$30,000 \$5,000 <b>Subtotal</b> \$3,650,174 \$3,650,174 \$3,650,174 <b>Subtotal</b>	\$250,000 \$1,356,250 \$980,000 \$76,250 \$4,889 \$1,630 \$32,593 \$85,000 \$272,222 \$118,056 \$200,000 \$1,44,000 \$5,785 \$105,000 \$5,000 \$3,650,174 \$182,509 \$547,526 \$4,927,735	Sheet pile wall (1,750 linear feet and 16 feet deep). Divert groundwater from upper bluff area around Kreher Park 275 linear feet, 10 feet wide and 12 feet deep 275 linear feet, 6 feet wide and 8 feet deep 275 linear feet, 4 feet wide and 8 feet deep 0.5 ft. topsoil cover over clay cap Seeding Marina Parking Lot Area 3 ft. of clay over former coal tar dump area 3 ft. of clay at WWTP area (post demolition) 0.5 ft. topsoil cover over clay cap Seeding For water runoff during storm post-remediation
					Total_	\$5,657,770	

Table F2-7
Alternate GW5: Permeable Reactive Barrier Well

Post	
Construction	Shallow Groundwater - Kreher Park

Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Costs	<u>Total</u>
	1 Annual Inspections	yr	30	\$500	\$15,000
	2 Post-Closure Reporting/Record Keeping	yr	30	\$500	\$15,000
	3 Cap Maintenance	yr	30	\$1,000	\$30,000
	5 Groundwater monitoring	yr	30	\$25,000	\$750,000
	6 Annual cap inspection and reporting	yr	30	\$5,000	\$150,000
			Subtotal	\$32,000	\$960,000

shallow groundwater monitoring

Present worth @7% Discount

\$397,088

## **GRAND TOTAL \$6,218,469**

					Construction		OM & M	Estimated
Summary		Capital Costs M	ob / Demob	<b>Engineering</b>	Oversight	Contingency	Costs	Cost
	Installation of surface barrier - upper bluff area	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
	Installation of PRB wall and vertical barrier - Kreher Park	\$3,650,174	\$182,509	\$547,526	\$547,526	\$730,035	\$397,088	\$6,054,858
	Total Estimated Cost	\$3,755,730	\$187,786	\$563,359	\$563,359	\$751,146	\$397,088	\$6,218,469

Includes groundwater monitoring costs for shallow groundwater

Table F2-8
Alternate GW6: In-situ Chemical Oxidation

		Alterna	ate GW6: In-	situ Chemical	Oxidation	
In-situ Treatmer	nt In-situ Chemical Oxidation					
					Total Area:	
	1 Asphalt Pavement -				26,000 sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches	surface			22,000 sq ft	NSPW Property North of St. Claire Street
	molades o mones stone, o mones binder, 2 mones t	surface.			98,000 sq ft	Marina Parking Lot Area
	0.1				96,000 Sq II	Mailia Faiking Lot Alea
	2 Low Permeability Cap -					
	Includes 3 feet of clay.				42,500 sq ft	Former Coal Tar Dump Area
Upland Area	Copper Falls Aquifer					
Item No.	ltem	<u>Unit</u>	Quantity	Unit Cost	Total	Notes
	<del></del>					<del></del>
	1 Groundwater Extraction Wells	each	7	\$5,000	\$35,000	Additional extraction wells
	2 Pumps	each	7	\$2,500	\$17,500	Additional Oxfraolion Wollo
		In ft	1.000	\$50		
	3 Lateral piping		,	*	\$50,000	
	4 UST/OWS System	Est.	1	\$15,000	\$15,000	Upgrade existing system
	5 Wastewater treatment equipment	Est.	1	\$25,000	\$25,000	Upgrade existing system
	6 Drilling	per gal	750,000	\$2	\$1,500,000	500 holes, 1,500 gallons per hole @ \$2 per gallon
	7 Reagent Injection	per week	50	\$7,500	\$375,000	3,000 gallons per day
				Subtotal	\$2,017,500	
	Mobilization/Demobilization @	5%	of	\$2,017,500	\$100,875	
	Engineering @	15%	of	\$2,017,500	\$302,625	
		15%	of			
	Construction Oversight @	15%	Of	\$2,017,500	\$302,625	
				Subtotal	\$2,723,625	
	Contingency @	20%	of	\$2,017,500	\$403,500	
				Total	\$3,127,125	
Post Constructi	on Copper Falls Aquifer					
Item No.	Item	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	Notes
item ivo.	1 Operation and Maintenance	year	7	\$57,600	\$403,200	Existing groundwater extraction system
		,				
	2 Groundwater extraction (existing wells)	year	7	\$394,200	\$2,759,400	15 gpm @ \$0.05
	3 Groundwater Monitoring	year	7	\$25,000	\$175,000	
	4 Annual report	year	7	\$5,000	\$35,000	
			Subtotal	\$481,800	\$3,372,600	
		Present worth	@7% Discount		\$2,596,420	
				Total	\$5,723,545	
					,	
	Shallow Groundwater - Filled Ravine					
Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
item No.		Est.	1	\$50.000	\$50.000	
	1 Building Demolition		-	* ,	* /	Center section of NSPW building overlying filled ravine.
	2 Vent Well Installation	each	10	\$2,500	\$25,000	10 passive vent wells
	3 Drilling	per gal	450,000	\$2	\$900,000	300 holes, 1,500 gallons per hole @ \$2 per gallon
	4 Reagent Injection	per week	30	\$7,500	\$225,000	3,000 gallons per day
	5 Installation of new asphalt pavement	sq. yd.	2,889	\$25	\$72,222	NSPW Property South of St. Claire Street (includes grading)
	6 Installation of new asphalt pavement	sq. yd.	2,444	\$25	\$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	\$1,333,333	, ,
	Mobilization/Demobilization @	5%	of	\$1,333,333	\$66,667	
	Engineering @	15%	of	\$1,333,333	\$200,000	
	Construction Oversight @	15%		\$1,333,333	\$200,000	
	Construction Oversight @	15%	of			
				Subtotal	\$1,800,000	
	Contingency @	20%	of	\$1,333,333	\$266,667	
				Total	\$2,066,667	
Post Constructi	on Shallow Groundwater - Filled Ravine					
Item No.	<u>ltem</u>					
	1 Groundwater Monitoring	year	7	\$10,000	\$70,000	
	2 Annual report	year	7	\$2,500	\$17,500	
		,	Subtotal	\$12,500	\$87,500	
			-	, , , , , , , , , , , , , , , , , , , ,	, , , , , , , , , , , , , , , , , , ,	
		Present worth	=			
		Present worth	@7% Discount		\$67,363	

Total

\$2,134,029

Table F2-8
Alternate GW6: In-situ Chemical Oxidation

Kreher Park	Shallow Groundwater - Kreher Park	11.5		11.22.0	<b>T.</b>		Neg		
Item No.	<u>ltem</u>	<u>Unit</u>	<b>Quantity</b>	Unit Cost	<u>Total</u>		<u>Notes</u>		
	1 Clear and Grub	est.	1	\$10,000	\$10,000				
	2 Excavation	су	3,935	\$10	\$39,352				
	3 Bench scale test	est.	1	\$5,000	\$5,000				
	4 Reagent Mixing	су	3,935	\$50	\$196,759				
	5 Drilling	per gal	225,000	\$2	\$450,000		150 holes, 1,500	gallons per hol	e @ \$2 per gallon
	6 Reagent Injection	per week	15	\$7,500	\$112,500		3,000 gallons pe		
	7 Installation of new asphalt pavement	sq. yd.	10,889	\$25	\$272,222		Marina Parking L		
	8 Installation of low permeability cap	су	4,722	\$25	\$118,056		3 ft. of clay over		
	9 Top Soil	sq. yd.	4,722	\$18	\$85,000		0.5 ft. topsoil cov	er over clay cap	)
	10 Vegetation	acre	1	\$3,500	\$3,500		Seeding		
	11 Storm water Drainage System	Basin	2	\$30,000	\$60,000		For water runoff	during storm po	st-remediation
				Subtotal	\$1,352,389				
	Mobilization/Demobilization @	5%	of	\$1,352,389	\$67,619				
	Engineering @	15%		\$1,352,389	\$202,858				
	Construction Oversight @	15%		\$1,352,389	\$202,858				
				Subtotal	\$1,825,725				
	Contingency @	20%	of	\$1,352,389	\$270,478				
	Total			Total	\$2,096,203				
Item No.	on Shallow Groundwater - Kreher Park Item								
item No.	1 Groundwater Monitoring	year	7	\$15,000	\$105,000				
	2 Annual report	vear	7	\$2.500	\$17,500				
	subtotal	year	Subtotal		\$122,500				
	Gustotai		Cubiciui	Ψ11,000	<b>\$122,000</b>				
	I	Present wort	h @7% Discour	nt	\$94,308				
				Total	\$2,190,510				
			GR	AND TOTAL	\$10,048,085				
	In-situ chemical oxidation								
•	To the state of a track of		Camital Cast	Mah / Dam :		Construction	Cantinana	OM & M	Estimated_
<u>Summary</u>	In-situ chemical oxidation			Mob / Demob	Engineering	Oversight	Contingency	Costs	<u>Cost</u>
	Copper Falls Aquifer Shallow Groundwater - Filled Ravine		\$2,017,500		\$302,625	\$302,625	\$403,500	\$2,596,420	\$5,723,545 \$2,434,030
	Shallow Groundwater - Filled Ravine Shallow Groundwater - Kreher Park		\$1,333,333 \$1,352,389		\$200,000 \$202,858	\$200,000 \$202,858	\$266,667 \$270,478	\$67,363 \$94,308	\$2,134,029 \$3,100,510
	GRAND TOTAL		\$1,352,389		\$202,858	\$202,858 \$705,483	\$270,478	\$94,308	\$2,190,510 \$10,048,085
	GNAND TOTAL		φ4,103,222	φ <b>∠</b> 30,101	φ <i>1</i> υυ,463	φ <i>1</i> 05,463	φ940,044	ψ2,130,090	φ10,040,000

Table F2-9
Alternate GW7: Electrical Resistance Heating

In-situ Treatme	ent Electrical Resistance Heating				<del>-</del>	
	1 Asphalt Pavement - Includes 6 inches stone, 3 inches binder, 2 inches s	urface.			Total Area: 26,000 sq ft 22,000 sq ft 98,000 sq ft	NSPW Property South of St. Claire Street NSPW Property North of St. Claire Street Marina Parking Lot Area
	2 Low Permeability Cap - Includes 3 feet of clay.				42,500 sq ft	Former Coal Tar Dump Area
Upland Area	Copper Falls Aquifer					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Building Demolition 2 Electrodes - Copper Falls 3 Electrode installation 4 Lateral piping - electrodes 5 Six Phase Heating equipment 6 Six Phase Heating construction and setup 7 Temp. Monitoring Points 8 Electrical costs 9 Extraction wells 10 Extraction well pumps 11 Lateral piping - extraction wells 12 UST/OWS System 13 Wastewater treatment equipment 14 Vapor phase treatment equipment & GAC 15 Operation and Maintenance 16 Waste-water treatment & disposal 17 Probe/well abandonment	Est. each each In ft Est. each month each per gal In ft Est. Est. Est. month gallons Est.	1 200 200 2,000 1 1 24 12 12 12 1,500 1 1 1 1 12 10,512,000	\$50,000 \$2,500 \$5,000 \$500,000 \$500,000 \$1,000 \$7,500 \$3,500 \$75 \$15,000 \$25,000 \$4,800 \$0.05 \$272,500 <b>Subtotal</b>	\$50,000 \$500,000 \$1,000,000 \$100,000 \$500,000 \$500,000 \$24,000 \$600,000 \$90,000 \$42,000 \$112,500 \$15,000 \$25,000 \$25,000 \$57,600 \$525,600 \$272,500	Center section of NSPW building overlying filled ravine.  Upgrade existing system Upgrade existing system Upgrade existing system Existing groundwater extraction system 20 gpm @ \$0.05 25-percent of installation cost
	Mobilization/Demobilization @ Engineering @ Construction Oversight @ Contingency @	5% 15% 15% 20%	of of of	\$4,439,200 \$4,439,200 \$4,439,200 <b>Subtotal</b> \$4,439,200	\$221,960 \$665,880 \$665,880 <b>\$5,992,920</b> \$887,840	
Post Construct	<u>tion</u> Copper Falls Aquifer Item	Unit	Quantity	Total_	\$6,880,760 Total	
item No.	1 Groundwater Monitoring 2 Annual report	year year	5 5 Subtotal	\$25,000 \$5,000 \$30,000	\$125,000 \$25,000 \$150,000	
		Present worth	n @7% Discount	-	\$123,000	
				Total	\$7,003,760	

Table F2-9 Alternate GW7: Electrical Resistance Heating

Upland Area	Shallow Groundwater - Filled Ravine				
Item No.	Item	Unit	Quantity	Unit Cost	Total
	1 Building Demolition	Est.	1	\$50,000	\$50,000
	2 Electrodes - filled ravine	each	200	\$2,000	\$400,000
	3 Electrode installation	each	200	\$2,500	\$500,000
	4 Lateral piping - electrodes	In ft	2,000	\$50	\$100,000
	5 Six Phase Heating equipment	Est.	1	\$500,000	\$500,000
	6 Six Phase Heating construction and setup	Est.	1	\$500,000	\$500,000
	7 Temp. Monitoring Points	each	24	\$1,000	\$24,000
	8 Electrical costs	month	12	\$15,000	\$180,000
	9 Groundwater extraction well	each	4	\$2,500	\$10,000
	10 Vent wells	each	10	\$1,500	\$15,000
	11 Vapor phase treatment equipment & GAC	Est.	1	\$25,000	\$25,000
	12 Storage tanks & transfer pumps and piping	Est.	1	\$25,000	\$25,000
	13 Waste-water treatment & disposal	gallons	5,256,000	\$0.05	\$262,800
	14 Probe/well abandonment	Est.	1	\$127,500	\$127,500
	15 Installation of new asphalt pavement	sq. yd.	2,889	\$25	\$72,222
	16 Installation of new asphalt pavement	sq. yd.	2,444	\$25_	\$61,111
				Subtotal	\$2,852,633
	Mobilization/Demobilization @	5%	of	\$2,852,633	\$142,632
	Engineering @	15%	of	\$2,852,633	\$427,895
	Construction Oversight @	15%	of	\$2,852,633	\$427,895
	-			Subtotal	\$3,851,055
	Contingency @	20%	of	\$2,852,633	\$570,527
				Total	\$4,421,582
Post Construc	tion Shallow Groundwater - Filled Ravine				
Item No.	Item	Unit	Quantity	Unit Cost	Total
itom ito:	1 Groundwater Monitoring	year	5	\$10,000	\$50,000
	2 Annual report	year	5	\$2,500	\$12,500
	2 / unida roport	you	Subtotal	\$12,500	\$62,500
		Present worth	@7% Discount	<u> </u>	\$51,250
				Total	\$4,472,832

 $\frac{\text{Notes}}{\text{Center section of NSPW building overlying filled ravine.}}$ 

## Upgrade existing system

10 gpm @ \$0.05 for 12 months (existing treatment system) 25-percent of installation cost NSPW Property South of St. Claire Street (includes grading) NSPW Property North of St. Claire Street (includes grading)

Table F2-9
Alternate GW7: Electrical Resistance Heating

Kreher Park	Shallow Groundwater - Kreher Park					
Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
	1 Clear and Grub	Est.	1	\$10,000	\$10,000	
	Electrodes - former seep / coal tar dump and TW-					
	2 11areas	each	150	\$2,000	\$300,000	
	3 Electrode installation	each	150	\$2,500	\$375,000	
	4 Lateral piping - electrodes	In ft	2,000	\$50	\$100,000	
	5 Six Phase Heating equipment	Est.	0	\$500,000	\$0	Will utilize same equipment for filled ravine
	6 Six Phase Heating construction and setup	Est.	1	\$500,000	\$500,000	
	7 Temp. Monitoring Points	each	24	\$1,000	\$24,000	
	8 Electrical costs	month	12	\$15,000	\$180,000	Will utilize same equipment for filled ravine
	9 Groundwater extraction well	each	4	\$2,500	\$10,000	
	10 Vent wells	each	10	\$1,500	\$15,000	
	11 Vapor phase treatment equipment & GAC	Est.	1	\$25,000	\$25,000	
	12 Storage tanks & transfer pumps and piping	Est.	1	\$250,000	\$250,000	
	13 Waste-water treatment & disposal	gallons	10,512,000	\$0.05	\$525,600	20 gpm @ \$0.05 for 12 months (existing treatment system)
	14 Probe/well abandonment	Est.	1	\$96,250	\$96,250	25-percent of installation cost
	15 Installation of new asphalt pavement	sq. yd.	10,889	\$25	\$272,222	Marina Parking Lot Area
	16 Installation of low permeability cap	су	4,722	\$25	\$118,056	3 ft. of clay over former coal tar dump area
	17 Top Soil	sq. yd.	4,722	\$18	\$85,000	0.5 ft. topsoil cover over clay cap
	18 Vegetation	acre	1	\$3,500	\$3,500	Seeding
	19 Storm water Drainage System	Basin	2	\$30,000	\$60,000	For water runoff during storm post-remediation
				Subtotal	\$2,949,628	
	Mobilization/Demobilization @	5%	of	\$2,949,628	\$147,481	
	Engineering @	15%	of	\$2,949,628	\$442,444	
	Construction Oversight @	15%	of	\$2,949,628	\$442,444	
	·			Subtotal	\$3,981,998	•
	Contingency @	20%	of	\$2,949,628	\$589,926	•
				Total	\$4,571,923	- -
Post Construc	tion Shallow Groundwater - Kreher Park					
Item No.	Item	Unit	Quantity	Unit Cost	Total	
<del></del>	1 Groundwater Monitoring	vear	5	\$15,000	\$75,000	
	2 Annual report	year	5	\$2,500	\$12,500	
	<del></del>	,	Subtotal	\$17,500	\$87,500	
		Dragant wort	h @7% Discount	-	\$71,750	•
		riesein word	II @ / /o DISCOUIIL	-	\$71,730	•
				Total	\$4,643,673	
			GR.	AND TOTAL	\$16,120,265	
						Construction OM & M
Summary	Electrical Resistance Heating		Capital Costs I	Mob / Demob	Engineering	Oversight Contingency Costs Estimated Cost
	Copper Falls Aguifer		\$4,439,200	\$221,960	\$665,880	\$665,880 \$887,840 \$123,000 \$7,003,760
	Shallow Groundwater - Filled Ravine		\$2,852,633	\$142,632	\$427,895	\$427,895 \$570,527 \$51,250 \$4,472,832
	Shallow Groundwater - Filled Ravine		\$2,949,628	\$147,481	\$442,444	
	CDAND TOTAL		640.044.464	¢540,070	£4 E0C 040	\$4.500.040

\$10,241,461

\$512,073

\$1,536,219

\$1,536,219

\$2,048,292

\$246,000

\$16,120,265

**GRAND TOTAL** 

Table F2-10
Alternate GW8: Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)

Total Area:  1 Asphalt Pavement - Includes 6 inches stone, 3 inches binder, 2 inches surface.  Total Area:  26,000 sq ft NSPW Property South of St. Cla	
Thomas of the total of the tota	01.001
2 Low Permeability Cap -	
Includes 3 feet of clay. 42,500 sq ft Former Coal Tar Dump Area	
Upland Area Copper Falls Aquifer (DUS)	
<u>Item No.                                    </u>	
1 Steam injection well each 12 \$25,000 \$300,000	
2 Steam extraction well per gal 9 \$20,000 \$180,000	
3 Lateral piping In ft 1,000 \$250 \$250,000	
4 Temp. Monitoring Points each 12 \$2,500 \$30,000	
5 Steam Injection System Est. 1 \$350,000 \$250,000	
6 Steam generation cost month 6 \$150,000 \$900,000	
7 Electrodes - Copper Falls each 50 \$2,500 \$125,000	
8 Electrode installation each 50 \$5,000 \$250,000	
9 Lateral piping - electrodes In ft 10,000 \$75 \$750,000	
10 Six Phase Heating equipment Est. 1 \$250,000 \$250,000	
11 Six Phase Heating construction and setup Est. 1 \$250,000 \$250,000	
12 Electrical costs month 6 \$50,000 \$300,000	
13 UST/OWS System Est. 1 \$15,000 \$15,000 Upgrade existing system	
14 Wastewater treatment equipment Est. 1 \$25,000 \$25,000 Upgrade existing system	
15 Vapor phase treatment equipment & GAC Est. 1 \$25,000 \$25,000 Upgrade existing system	
16 Operation and Maintenance month 6 \$4,800 \$28,800 Existing groundwater extraction	system
17 Waste-water treatment & disposal gallons 5,184,000 \$0.10 \$518,400 20 gpm @ \$0.10	•
17 Probe/well abandonment Est. 1 \$190,000 \$190,000 25-percent of installation cost	
Subtotal \$4,637,200	
Mobilization/Demobilization @ 5% of \$4,637,200 \$231,860	
Engineering @ 15% of \$4,637,200 \$695,580	
Construction Oversight @ 15% of \$4,637,200 \$695,580	
Subtotal \$6,260,220	
Contingency @ 20% of \$4,637,200 \$927,440	
Total \$7,187,660	
Post Construction Copper Falls Aquifer	
<u>Item No.                                      </u>	
1 Groundwater Monitoring year 5 \$25,000 \$125,000	
2 Annual report year 5 \$5,000 \$25,000	
Subtotal         \$30,000         \$150,000	
Present worth @7% Discount \$123,000	
Total \$7,310,660	

Table F2-10
Alternate GW8: Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)

<u>Upland Area</u> Shallow Groundwater - Filled Ravine (CROW)					
Item No. Item	<u>Unit</u>	<b>Quantity</b>	Unit Cost	<u>Total</u>	<u>Notes</u>
1 Building Demolition	Est.	1	\$50,000	\$50,000	Center section of NSPW building overlying filled ravine.
2 Steam injection well	each	10	\$25,000	\$250,000	
3 Steam extraction well	per gal	5	\$20,000	\$100,000	
4 Lateral piping	In ft	1,000	\$250	\$250,000	
5 Temp. Monitoring Points	each	12	\$1,000	\$12,000	
6 Steam Injection System	Est.	1	\$250,000	\$250,000	
7 Steam generation cost	month	6	\$50,000	\$300,000	
8 UST/OWS System	Est.	1	\$15,000	\$15,000	Upgrade existing system
9 Wastewater treatment equipment	Est.	1	\$25,000	\$25,000	Upgrade existing system
10 Vapor phase treatment equipment & GAC	Est.	1	\$25,000	\$25,000	Upgrade existing system
11 Operation and Maintenance	month	6	\$4,800	\$28,800	Existing groundwater extraction system
12 Waste-water treatment & disposal	gallons	\$2,592,000	\$0.10	\$259,200	10 gpm @ \$0.2
13 Installation of new asphalt pavement	sq. yd.	2,889	\$25	\$72,222	NSPW Property South of St. Claire Street (includes grading)
14 Installation of new asphalt pavement	sq. yd.	2,444	\$25	\$61,111	NSPW Property North of St. Claire Street (includes grading)
			Subtotal	\$1,698,333	
Mobilization/Demobilization @	5%	of	\$1,698,333	\$84,917	
Engineering @	15%	of	\$1,698,333	\$254,750	
Construction Oversight @	15%	of	\$1,698,333	\$254,750	
			Subtotal	\$2,292,750	
Contingency @	20%	of	\$1,698,333	\$339,667	
			Total	\$2,632,417	
Post Construction Shallow Groundwater - Filled Ravine					
Item No. Item	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	
1 Groundwater Monitoring	year	5	\$10,000	\$50,000	
2 Annual report	year	5	\$2,500	\$12,500	
		Subtotal_	\$12,500	\$62,500	
	Present worth	@7% Discount	_	\$51,250	
			Total	\$2,683,667	

Table F2-10
Alternate GW8: Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)

Upland Area	Shallow Groundwater - Kreher Park (CROW)								
Item No.	<u>ltem</u>	<u>Unit</u>	<b>Quantity</b>	Unit Cost	<u>Total</u>	<u>N</u>	<u>lotes</u>		
	1 Steam injection well	each	9	\$25,000	\$225,000				
	2 Steam extraction well	per gal	4	\$20,000	\$80.000				
	3 Lateral piping	In ft	1,000	\$250	\$250,000				
	4 Temp. Monitoring Points	each	12	\$1,000	\$12,000				
	5 Steam Injection System	Est.	1	\$250,000	\$250,000				
	6 Steam generation cost	month	6	\$50,000	\$300,000				
	7 Storage tanks, transfer pumps and piping	Est.	1	\$15,000	\$15,000	L	Jpgrade existing	svstem	
	8 Wastewater treatment equipment	Est.	1	\$25,000	\$25,000		Jpgrade existing	•	
	9 Vapor phase treatment equipment & GAC	Est.	1	\$25,000	\$25,000		Jpgrade existing	, ,	
	10 Operation and Maintenance	month	6	\$4,800	\$28,800			vater extraction sys	tem
	11 Waste-water treatment & disposal	gallons	\$2,592,000	\$0.10	\$259,200		0 gpm @ \$0.20		
	12 Installation of new asphalt pavement	sq. yd.	1,667	\$25	\$41,667		01		Street (includes grading)
	13 Installation of new asphalt pavement	sq. yd.	2,778	\$25	\$69,444				Street (includes grading)
	subtotal	oq. ya.	2,0	Subtotal_	\$1,581,111		10. 11		Jacot (molados grading)
	Mobilization/Demobilization @	5%	of	\$1.581.111	\$79,056				
	Engineering @	15%	of	\$1,581,111	\$237,167				
	Construction Oversight @	15%	of	\$1,581,111	\$237,167				
	Construction Oversight @	1376	OI	Subtotal	\$2,134,500				
	Contingency @	20%	of	\$1,581,111	\$316,222				
	Contingency &	2076	Oi	\$1,561,111	φ310,222				
				Total	\$2,450,722				
Post Constructi	ion Shallow Groundwater - Kreher Park								
Item No.	Item	Unit	Quantity	Unit Cost	Total				
item No.	1 Groundwater Monitoring	year	<u>Quantity</u> 5	\$15,000	\$75,000				
	2 Annual report	year	5	\$2,500	\$12,500				
	2 Annual report	year	Subtotal	\$17,500	\$87,500				
			_	<u> </u>					
	!	Present worth	n @7% Discount	<u>-</u>	\$71,750				
				Total	\$2,522,472				
			G	RAND TOTAL	\$12 516 <b>7</b> 99				
			G	NAND TOTAL	Ψ12,310,133				
						Construction			
Summary	Steam Injection (DUS or CROW)		Capital Costs M	lob / Demob	Engineering		Contingency	OM & M Costs	Estimated Cost
- unimary	Copper Falls Aquifer		\$4,637,200	\$231,860	\$695,580	\$695,580	\$927,440	\$123,000	\$7,310,660
	Shallow Groundwater - Filled Ravine		\$1.698.333	\$84,917	\$254,750	\$254,750	\$339,667	\$51,250	\$2,683,667
	Shallow Groundwater - Fined Ravine Shallow Groundwater - Kreher Park		\$1,581,111	\$79,056	\$237,167	\$237,167	\$316,222	\$71,750	\$2,522,472
	GRAND TOTAL	-	\$7,916,644	\$395,832	\$1,187,497	\$1,187,497	\$1,583,329	\$246,000	\$12,516,799
	GRAND TOTAL		φ1,310,044	<b></b> დაუა,ია <b>∠</b>	φ1,101,431	φ1,101,431	φ1,303,329	<b>φ</b> 240,000	φ12,310,733

Table F2-11
Alternate GW9A: Existing Groundwater Extraction (Continued Operation)

Removal	Groundwater Extraction and On-site Treatment				Total Area:					
	1 Asphalt Pavement - Includes 6 inches stone, 3 inches binder, 2 inches surface.					sq ft sq ft				
Upland Area	Shallow Groundwater - Filled Ravine									
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>		<u>Notes</u>			
	Installation of new asphalt pavement     Installation of new asphalt pavement	sq. yd. sq. yd.	1,778 2,444	\$25 \$25 <b>Subtotal</b>	\$44,444 \$61,111 <b>\$105,556</b>				ire Street (includes gradin ire Street (includes gradino	
	Mobilization/Demobilization @ Engineering @ Construction Oversight @ Contingency @	5% 15% 15% 20%	of of of	\$105,556 \$105,556 \$105,556 <b>Subtotal</b> \$105,556	\$5,278 \$15,833 \$15,833 <b>\$142,500</b> \$21,111					
				Total_	\$163,611					
Post Construct Item No.	nnstruction Copper Falls Aquifer/Filled Ravine    No.   Item			Unit Cost \$57,600 \$78,840 \$35,000 \$7,500 \$178,940	Total \$1,728,000 \$2,365,200 \$1,050,000 \$225,000 \$5,368,200 \$2,220,466		Notes Existing groundwater extraction system 3 gpm @ \$0.05			
			GRA	ND TOTAL		Construction			Estimated	
Summary	Shallow Groundwater - Filled Ravine Copper Falls Aquifer/Filled Ravine GRAND TOTAL	-	Capital Costs § 105,556 \$0 \$105,556	\$5,278 \$0 \$5,278	Engineering \$15,833 \$0 \$15,833	Oversight \$15,833 \$0 \$15,833	\$0	0M & M Costs \$0 \$2,220,466 \$2,220,466	Cost \$163,611 \$2,220,466 \$2,384,078	

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

Removal	Groundwater Extraction and On-site Treatment					
	1. Apphalt Payament				Total Area: 16,000 sq ft	NCDW Draparty South of St. Claire Street
	1 Asphalt Pavement - Includes 6 inches stone, 3 inches binder, 2 inches s	urface			22,000 sq ft	NSPW Property South of St. Claire Street NSPW Property North of St. Claire Street
	morado o morios dieno, o morios sindor, e morios e	andoo.			98,000 sq ft	Marina Parking Lot Area
	2 Low Permeability Cap -				•	Ç
	Includes 3 feet of clay.				42,500 sq ft	Former Coal Tar Dump Area
Upland Area	Copper Falls Aquifer					
Item No.	<u>Item</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Extraction wells	each	12	\$7,500	\$90,000	
	2 Pumps	per gal	12	\$3,500	\$42,000	
	3 Lateral piping	In ft	1,500	\$75	\$112,500	
	4 UST/OWS System	Est.	1	\$15,000	\$15,000	Upgrade existing system
	5 Wastewater treatment equipment	Est.	1	\$25,000	\$25,000	Upgrade existing system
				Subtotal	\$284,500	
	Mobilization/Demobilization @	5%	of	\$284,500	\$14,225	
	Engineering @	15%	of	\$284,500	\$42,675	
	Construction Oversight @	15%	of	\$284,500	\$42,675	
				Subtotal	\$384,075	
	Contingency @	20%	of	\$284,500	\$56,900	
				Total	\$440,975	
Post Construc	tion Copper Falls Aquifer					
<u>ltem No.</u>	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Operation and Maintenance	year	30	\$57,600	\$1,728,000	Existing groundwater extraction system
	2 Groundwater extraction (existing wells)	year	30	\$394,200	\$11,826,000	15 gpm @ \$0.05
	3 Groundwater Monitoring	year	30	\$25,000	\$750,000	
	4 Annual cap inspection and reporting	year	30	\$5,000	\$150,000	
			Subtotal_	\$481,800	\$14,454,000	
		Present wor	th @7% Discou	nt	\$5,978,656	
			91 /0 D10000		ψο,οιο,οοο	

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

				Total	\$6,419,631	
Upland Area Item No.	Shallow Groundwater - Filled Ravine Item	<u>Unit</u>	Quantity	Unit Cost T	<u>otal</u>	Notes Notes
<u></u>	<del>_</del>	<u> </u>				
	1 Installation of new asphalt pavement	sq. yd.	1,778	\$25	\$44,444	NSPW Property South of St. Claire Street (includes grading)
	2 Installation of new asphalt pavement	sq. yd.	2,444	\$25_ Subtotal	\$61,111 <b>\$105,556</b>	NSPW Property North of St. Claire Street (includes grading)
	Mobilization/Demobilization @	5%	of	\$105,556	\$5,278	
	Engineering @	15%	of	\$105,556	\$15,833	
	Construction Oversight @	15%	of	\$105,556 Subtotal	\$15,833 <b>\$142,500</b>	
	Contingency @	20%	of	\$105,556	\$21,111	
				Total_	\$163,611	
Kreher Park	Shallow Groundwater					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Extraction trench	In ft	1,500	\$150	\$225,000	
	2 Sump and pump	each	1	\$20,000	\$20,000	
	3 Lateral piping	In ft	1,500	\$75	\$112,500	
	4 Treatment equipment	each	1	\$30,000	\$30,000	
	5 Building	each	1	\$25,000	\$25,000	
	6 UST/OWS System	Est.	1	\$15,000	\$15,000	••
	7 Installation of new asphalt pavement	sq. yd.	10,889	\$25	\$272,222	Marina parking lot
	8 Installation of low permeability cap	cy .	4,722	\$25	\$118,056	3 ft. of clay over former coal tar dump area
	9 Top Soil	sq. yd.	4,722	\$18	\$85,000	0.5 ft. topsoil cover over clay cap
	10 Vegetation	acre	1	\$3,500	\$3,500	Seeding
	11 Storm water Drainage System	Basin	2	\$30,000_	\$60,000	For water runoff during storm post-remediation
				Subtotal_	\$966,278	
	Mobilization/Demobilization @	5%	of	\$966,278	\$48,314	
	Engineering @	15%	of	\$966,278	\$144,942	
	Construction Oversight @	15%	of	\$966,278	\$144,942	
	•			Subtotal	\$1,304,475	
	Contingency @	20%	of	\$966,278	\$193,256	
				Total_	\$1,497,731	

Table F2-12 Alternate GW9B: Enhanced Groundwater Extraction

Post Construction Shallow Groun	ndwater
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ost Construc	tion Shallow Groundwater					
Item No.	<u>ltem</u>	<u>Unit</u>	Quantity	Unit Cost	<u>Total</u>	<u>Notes</u>
	1 Operation and Maintenance	year	30	\$57,600	\$1,728,000	
	2 Waste-water treatment & disposal	year	30	\$1,314,000	\$39,420,000	50 gpm @ \$0.05
	3 Groundwater Monitoring	year	30	\$25,000	\$750,000	
	4 Annual cap inspection and reporting	year	30	\$5,000	\$150,000	
		subtotal		\$1,401,600	\$42,048,000	
		Present wo	orth @7% Disco	unt	\$17,392,454	
				Subtotal	\$18,890,185	

# GRAND TOTAL \$25,415,372

		<u>Construction</u>						<b>Estimated</b>
<u>Summary</u>		Capital Costs Mo	b / Demob	<b>Engineering</b>	Oversight	Contingency	OM & M Costs	Cost
	Copper Falls Aquifer	\$284,500	\$14,225	\$42,675	\$42,675	\$56,900	\$5,978,656	\$6,419,631
	Shallow Groundwater - Filled Ravine	\$105,556	\$5,278	\$15,833	\$15,833	\$21,111	\$0	\$163,611
	Shallow Groundwater - Kreher Park	\$966,278	\$48,314	\$144,942	\$144,942	\$193,256	\$17,392,454	\$18,890,185
	GRAND TOTAL	\$1,356,333	\$67,817	\$203,450	\$203,450	\$271,267	\$23,371,111	\$25,473,427